

SCIENTIFICALS CONSULTING

EXPLORING
LIFELINE - - - ACT98

NIMMA EDITION

April 1999

LifeLine --- ACT98 Version 2.0
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WELCOME

An Overview of LifeLine - - - ACT98

Welcome to LifeLine --- ACT98, a unique database exploration tool. LifeLine is a technology developed by Scientificals Consulting for building explore-able databases, analysis and decision support systems, and ACT98 is the implementation of the LifeLine technology for environmental monitoring systems and databases. LifeLine ACT98 consists of the following components:

- A flexible data model of monitoring systems, that can be loaded with various monitoring databases.
- A query engine and user interface that supports exploration of a database by identifying "Scenarios", where a scenario defines that particular data set you wish to explore. The dataset can be viewed and analyzed within the program, or exported to other programs for more analysis.
- An analysis engine that supports visualization of scenario datasets as actuary curves. The actuary curves allow one to identify strong patterns in the monitoring database, and use them for decision support. You can compare a current management situation, to one previously encountered.

The NIVMA edition of LifeLine --- ACT98 is loaded with NIVMA's USSMUser database, and the resulting actuary curves represent the relationship between tree variables measured in the USSM monitoring system at a particular time, and the time it takes those trees to achieve a particular performance target (Free-to-Grow, Green-Up, etc). The user interface of LifeLine --- ACT98 NIVMA edition was customized to reflect the data in USSMUser. For a different database, the choices on the user interface would be different, though the program would function identically in processing the choices. That is LifeLine --- ACT98 takes on the character of the data it contains.

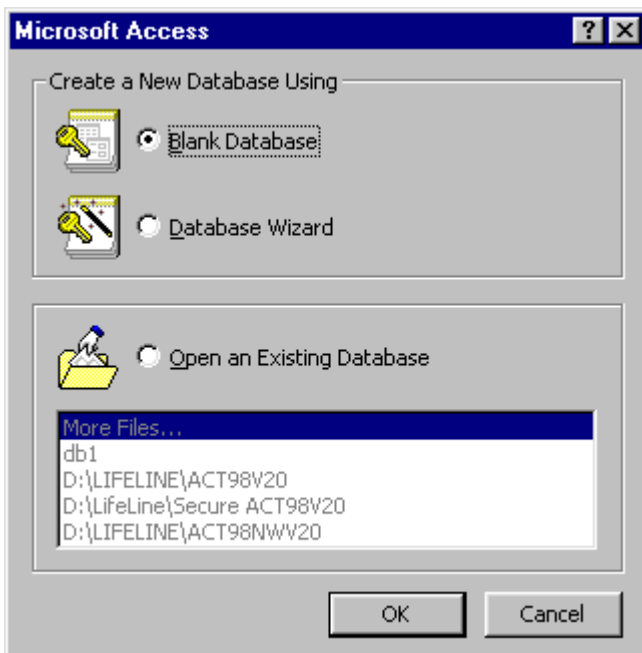
LifeLine --- ACT98 is implemented in Access97 by Microsoft and requires this program to run.

INSTALLATION NOTES

How to set up LifeLine --- ACT98 on your Computer

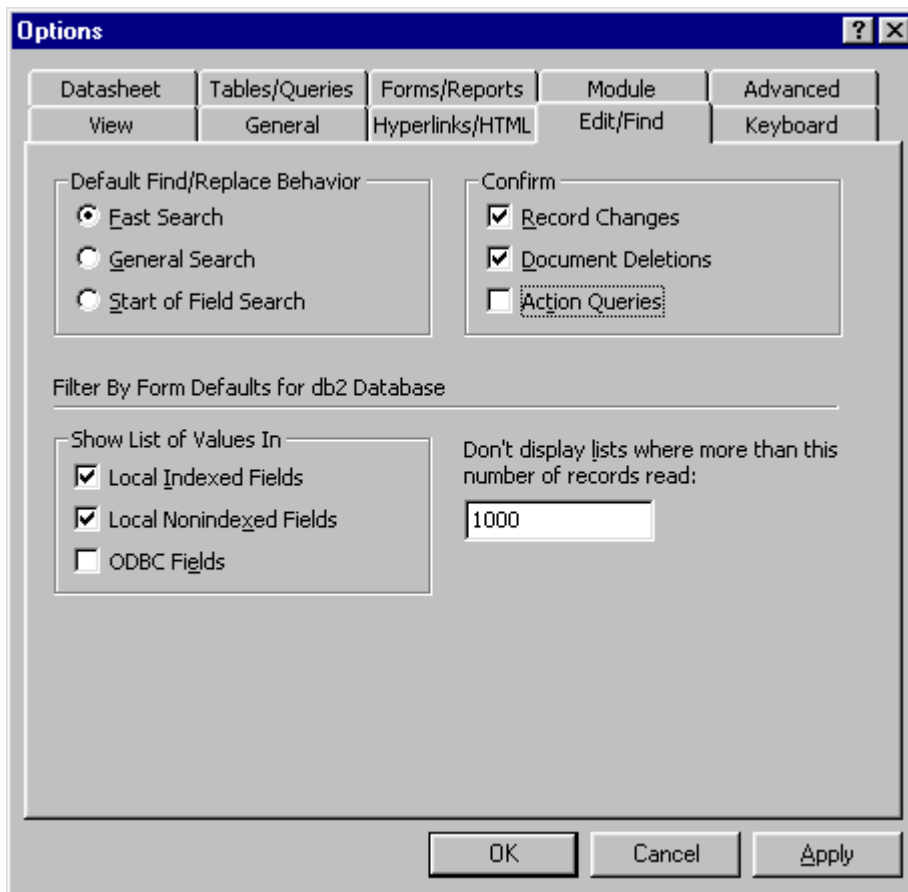
1. You must have a registered version of Access97 by Microsoft, as well as Windows95 or WindowsNT by Microsoft Inc.
2. A recommended minimum for a computer is a 120 MHz Pentium with 100 Mb free disc space prior to loading, and 16 Mb to run the program.
3. Create a new folder off your local drive (usually C or D) called "LifeLine". Do not install the LifeLine folder on a network drive.
4. Place all LifeLine --- ACT98 files in this folder. You should have the following files: SecureACT98V20.mdb (program), ipNIVMALicence.doc (licence agreement), and ACT98Manual.doc (the user manual).
5. Start Access97, then open the database SecureACT98V20.mdb within it.

The Access97 environment standard defaults ask for confirmation after every "action query", which are queries that affect the contents of a data table. Since LifeLine --- ACT98 uses a number of action queries, this service by Access97 can be irritating. To turn it off, start Access97.



The box "Create a New Database Using" appears upon startup. Choose "blank database" from the screen and click "O.K.". "File New Database" box appears next

and click "Create". Then go to the menubar and choose Tools/Options to call up the Options dialog box. Choose the Edit/Find tab, and you will view a screen with various checked options. If there is a check mark beside Confirm Action Queries, remove it. Click "O.K.". Close the blank database, and open SecureACT98V20.mdb. Action queries will no longer ask for manual confirmation when using Access97 on your computer, for LifeLine --- ACT98 or any other Access97 database. If you want the confirmation queries when working in other databases on your computer, you should turn this option back on.

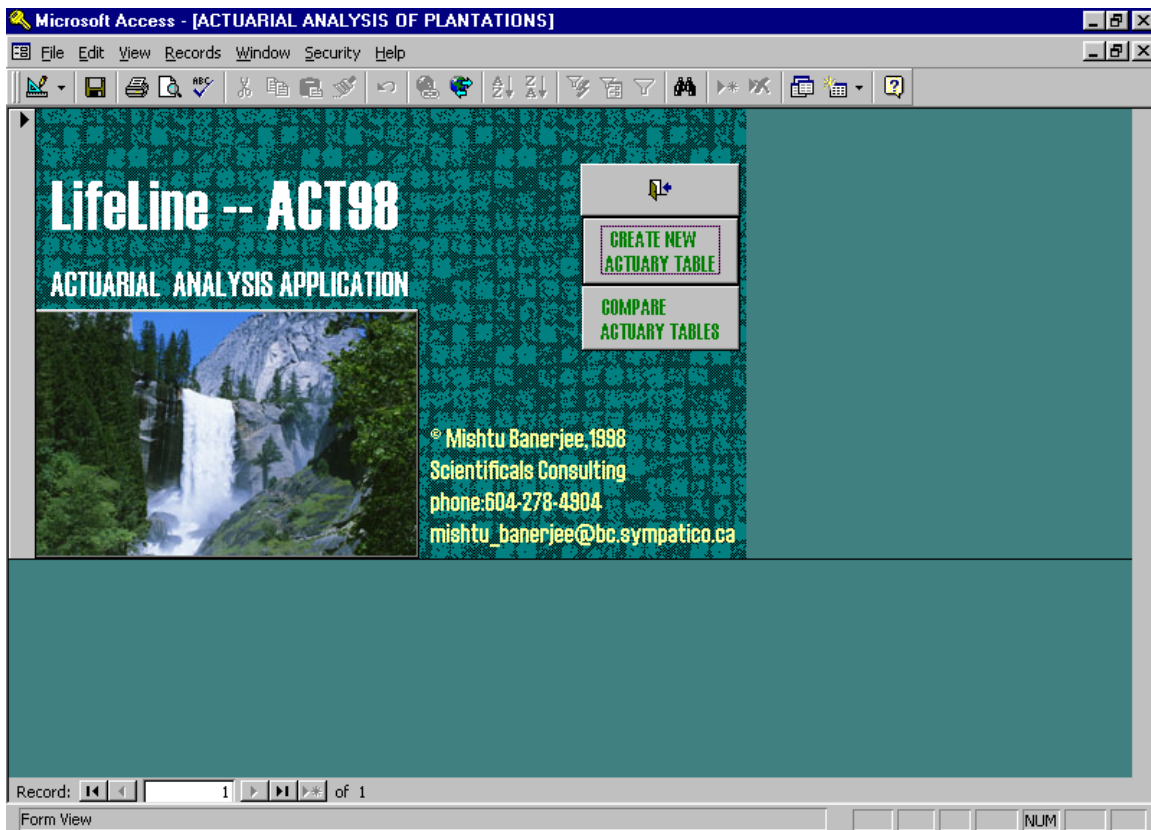


At this point LifeLine --- ACT98 should be successfully installed on your computer. It is now time to begin exploring!

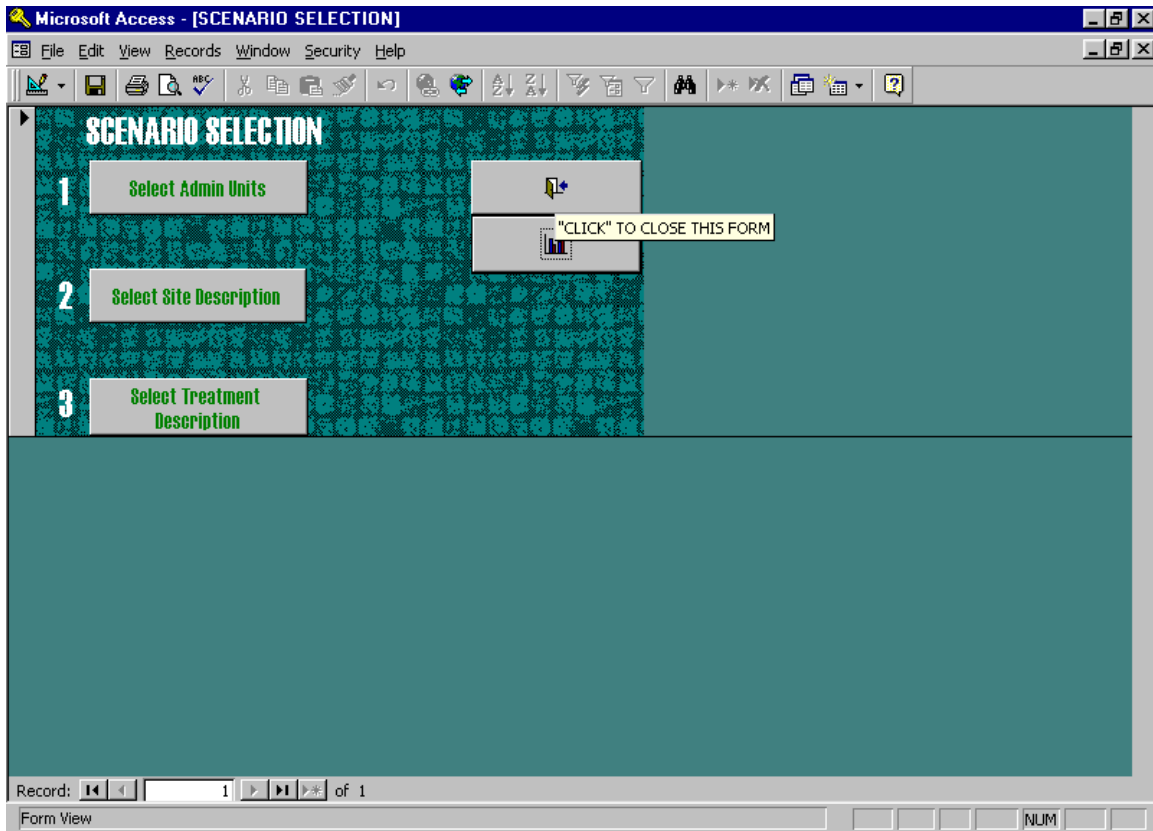
ACT98 TUTORIAL

How to Use and Interpret ACT98 Scenarios

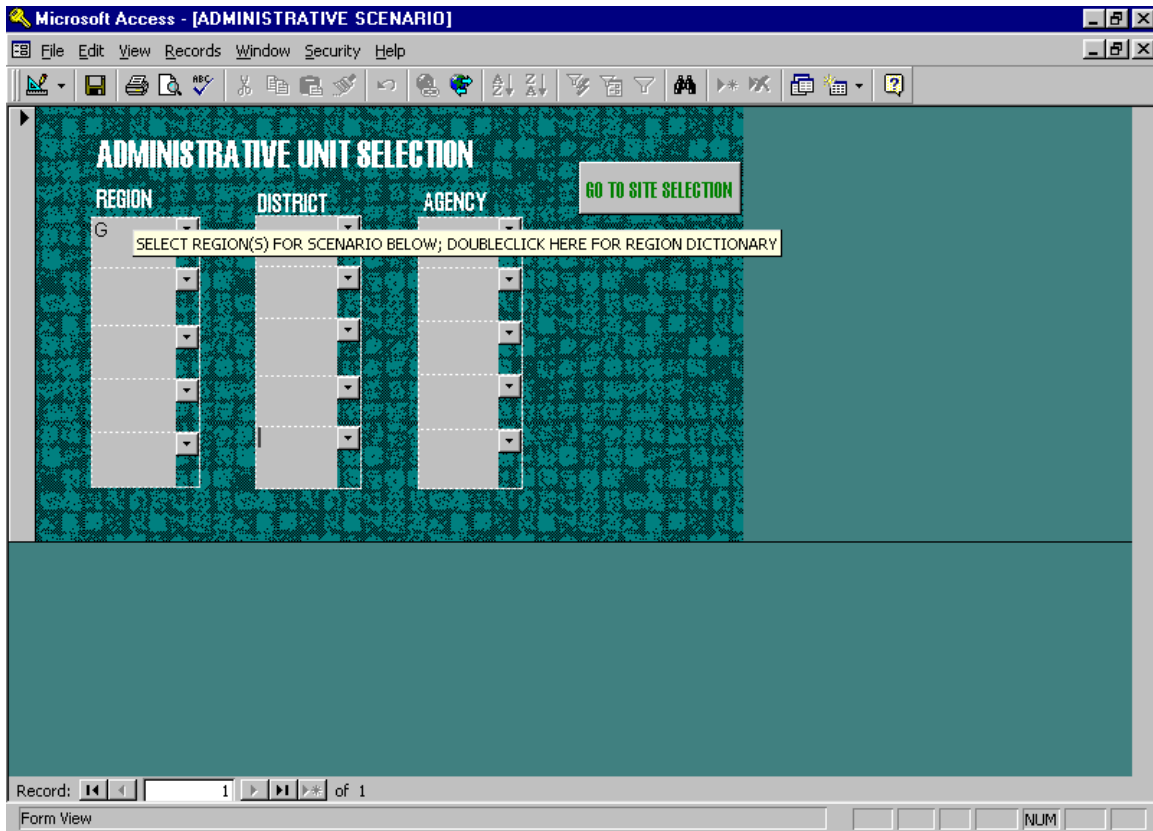
We will introduce LifeLine --- ACT98 by going through a practice run. You can follow along on your version. We begin with LifeLine --- ACT98's main menu



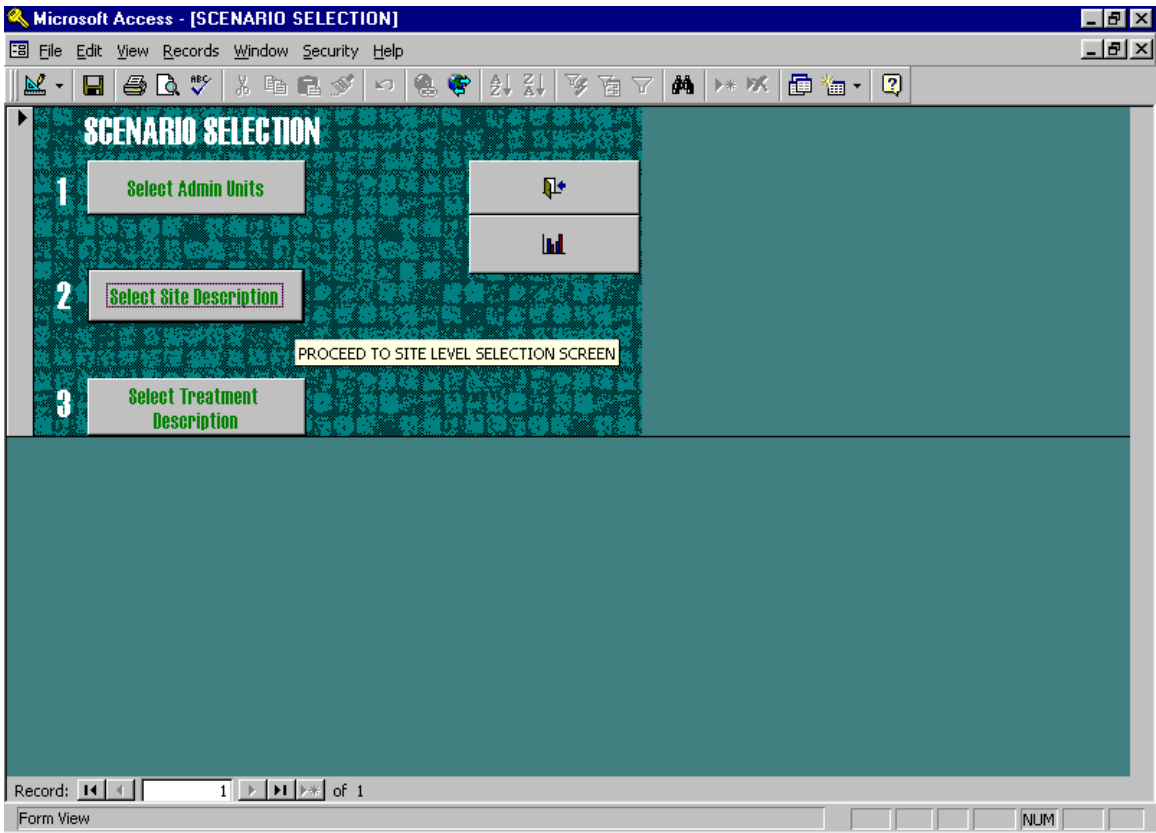
The top button (which looks like a closing door) closes the main menu form and exits the program. You will see a close button on most of the subsequent forms and can use them to step backwards through a set of choices. The second button begins the process of creating a new actuary table. The third button compares actuary table that have been previously built. That is, the second and third button represent alternate navigation choices in the program. Click on the first button "Create New Actuary Table"



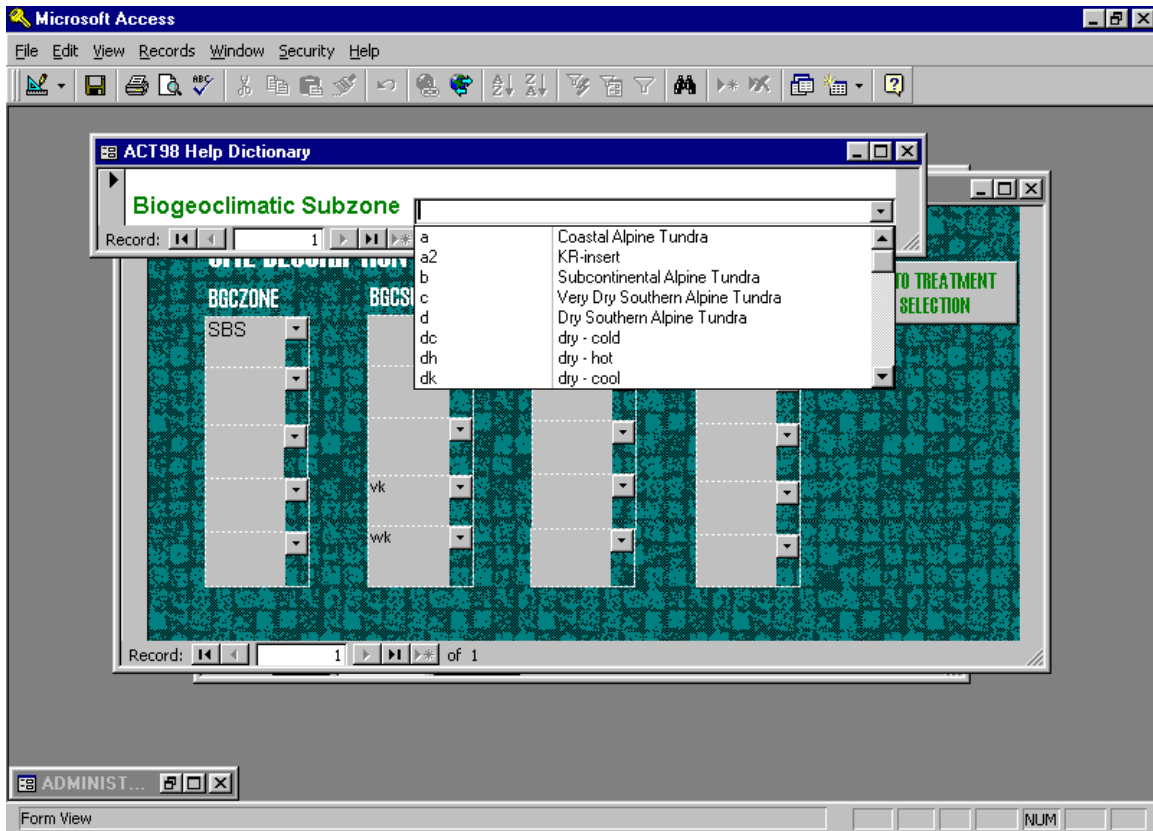
With this screen we begin Scenario selection. There are three numbered buttons that call up selection screens. There is also in the right-hand corner of the form a "close" button. When the cursor is over it, a context tip appears "click to close this form". Such tips occur when holding the cursor over most buttons in the program . The button below "close" has a graph icon. This button moves forward to the next selection screen. You should only hit this button once all your choices have been made on a form. We now step through the numbered buttons in order, beginning with "Select Admin Units".



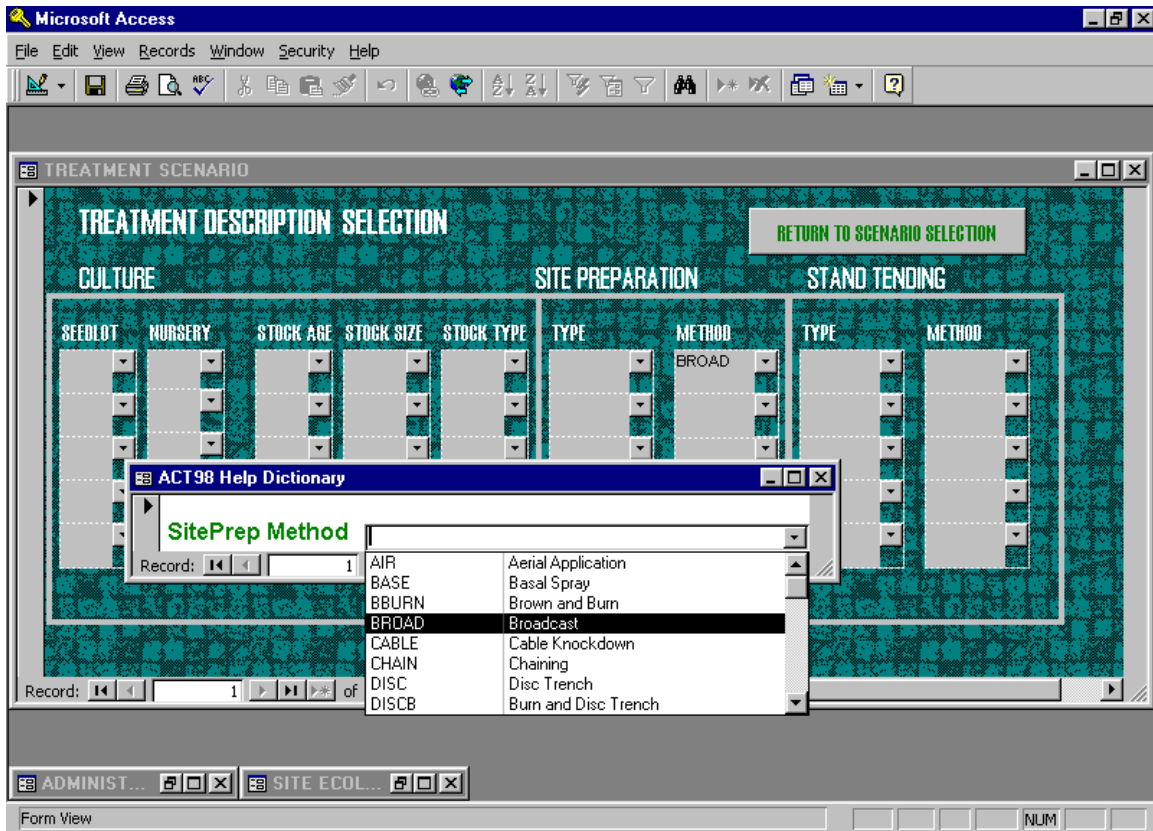
Clicking the arrow to the right of each box brings up a list of choices. You can make up to 5 choices for each selection category. For the selection category "Region" we have chosen "G" which stands for Prince George. We could make similar types of choices for "Districts" and for "Agency". What we are doing with these selections is identifying the detail of our scenario. Of course, if you choose an extremely detailed scenario, the likelihood of finding matching data will decrease. Also, if you choose a set of combinations that don't make sense, no data will result. Making no selection in a column of choices is the equivalent of "choosing all" (ie, that column will not be used as selection criteria). For example, choosing an agency and a district in which this agency has no data will result in no data returned. Having made our "administration level" selection, we now press the button "Go to Site Selection" to make site level selections.



We are returned to the "Scenario Selection" screen and now choose the "Select Site Description" button.



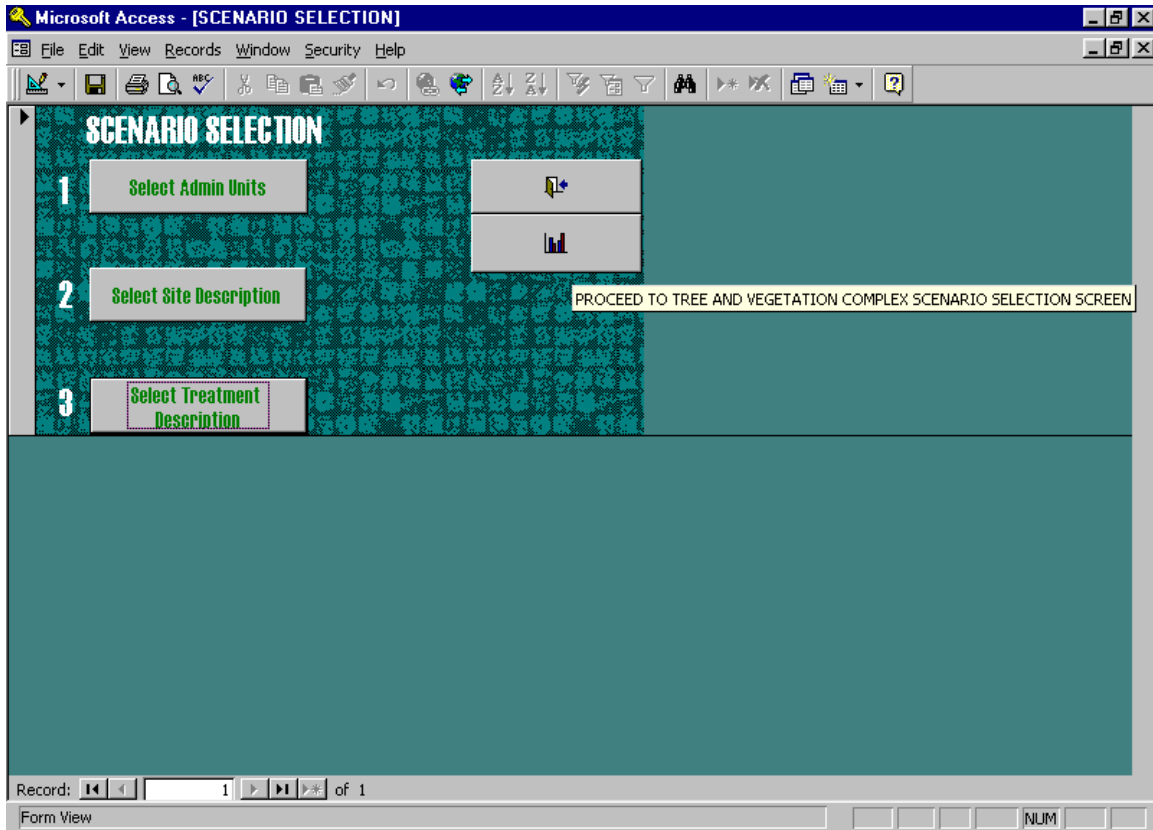
We continue defining our scenario, now at the site level. We have chosen a particular biogeoclimatic zone ("BGCZONE") SBS, and two subzones ("BGCSUBZONE") vk and wk. We're not quite sure those were the particular subzones we were looking for, so we click once on the "BGCSUBZONE" text, which calls up the ACT98 Help Dictionary. We can now scroll through the help dictionary selections to look at the various code definitions. ACT98 Help Dictionary support is available by clicking once on the text labels for most columns on selection screens. If in doubt, click once, and see if you get more information. Pressing the "Go To Treatment Selection" button returns us to the "Scenario Selection" screen where we select the button "Select Treatment Description".



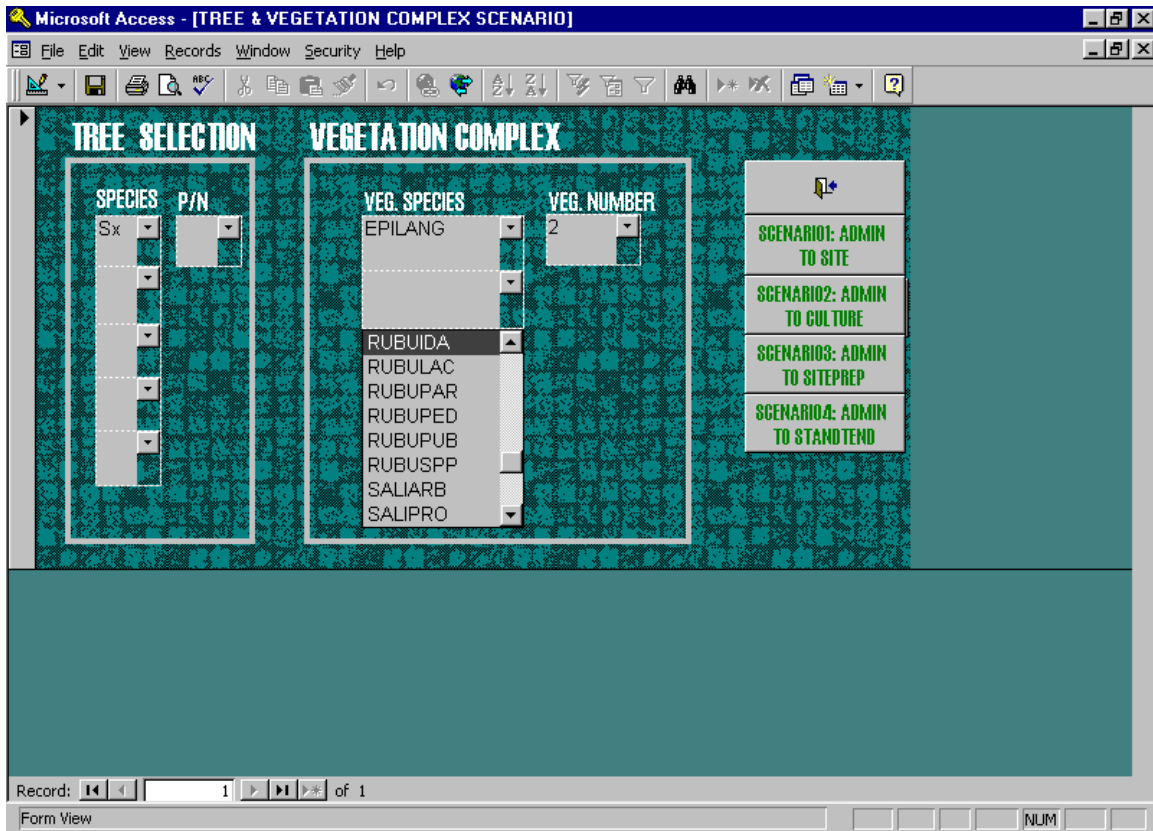
The treatment selection screen is separated into three areas: "Culture", "Site Preparation" and "Stand Tending". Culture information is available for most of the data in the USSMUser database that LifeLine --- ACT98 has loaded. There is less site preparation information. And much less stand tending information. Because of this, a detailed set of choices down to the level of stand tending could result in very small or no data sets matching. We've chosen a specific site preparation method, "broad" that is defined in the help dictionary. The button "Return to Scenario Selection" returns us to the Scenario Selection screen.

At this point, we have made all of our administration, site and treatment level choices. This identifies, for the USSMUser database loaded into LifeLine --- ACT98, a particular set of field sites called "installations", which represent a unit of land.

From the Scenario Selection screen we choose the button with the graph icon on that screen to move forward to defining our scenario at the level of individual trees.



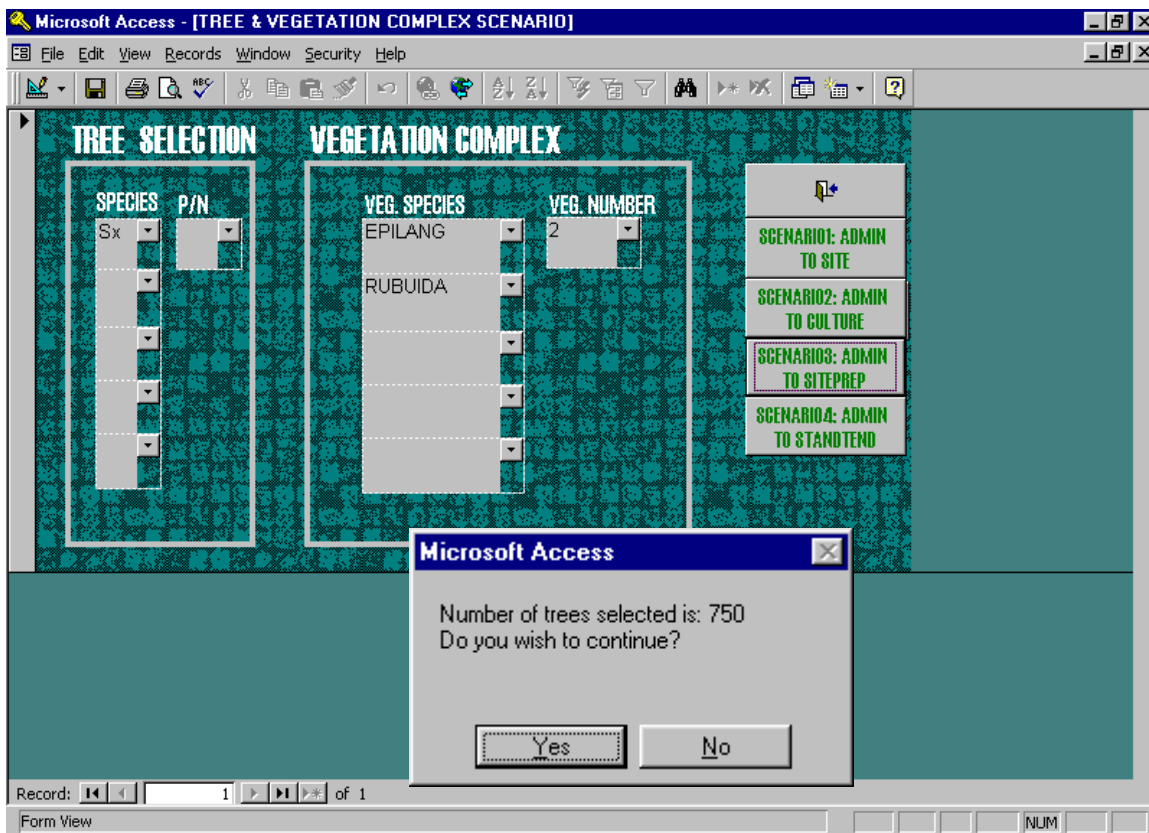
This moves us forward to the "Tree and Vegetation Level Scenario" screen. On this screen we select the tree species we are interested in and in our example we have chosen spruce coded as "Sx". We can select its origin as "P/N" where P=planted and N=natural. We made no choice in our example so both planted and natural spruce will be included in the result scenario dataset. We can detail the scenario down to the vegetation species we require to occur around a tree for it to be selected, if we wish.



Note, if you can't remember the codes for all the tree and vegetation species, the help dictionary is accessible by clicking on the "Species" and "Veg. Species" labels. For vegetation species we have chosen "Epilang" (fireweed) and Rubuida (red raspberry). As "Veg. Number" we have selected 2. Since there were 2 vegetation species selected, the choice of 2 in "Veg. Number" means that both species must be present for a tree to be selected. If we had selected a "Veg. Number" of 1, it would mean that a tree would be selected for the scenario if it had either "Epilang" or "Rubuida" around it. Say we had selected 5 species of surrounding vegetation. If we then chose a 5 as the "Veg. Number" it would mean that all 5 vegetation species would have to be around a tree for it to be selected (which might be highly unlikely). If we had made 4 species selections and chosen a "Veg. Number" of 2, then at least two of the selected vegetation species would have to be around a tree for it to be selected. If vegetation species selections are made, but no number is selected for "Veg Species", it is equivalent to a default value of "1" species on the selected list being required. If no species or "Veg. Number" is selected, then individual trees in your scenario will not be defined by the vegetation surrounding them. For those who like logic, if a number of vegetation species are chosen, and the "Veg. Number" equals the number of vegetation species, this is like an "and" statement in boolean logic. If a number of species are chosen, and "Veg. Number" selected is 1, this is like an "or" statement in boolean logic. Having made our tree level selections, we note that below the "close" button, there are 4 buttons:

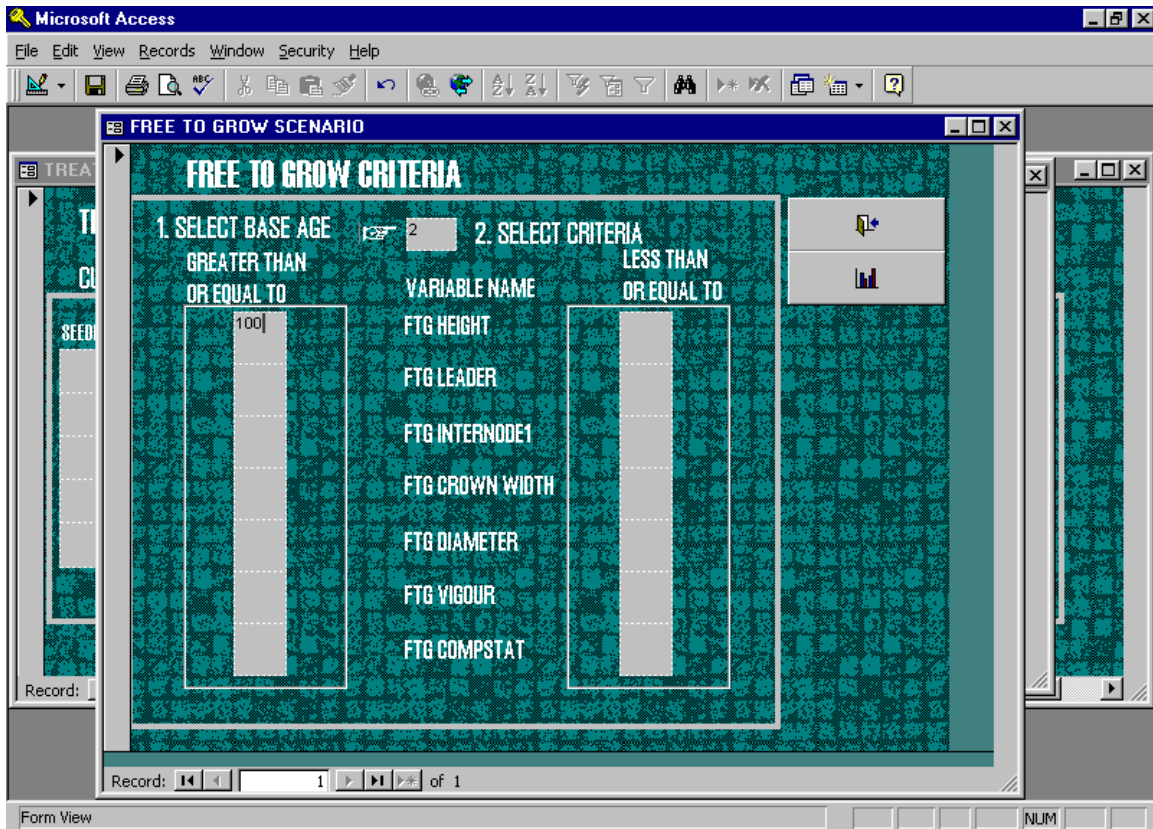
- "Scenario1: Admin to Site"
- "Scenario2: Admin to Culture"
- "Scenario3: Admin to SitePrep"
- "Scenario4: Admin to StandTend"

Recall that that there is less information in the source database USSMUser about stand tending than about Administration and Site level data. Each button leads to a different data set. If you have made choices that only concern "Admin" and "Site" information, you should select the button for "Scenario 1". If your choices include Culture information from the Treatment selection screen, you should select the button for "Scenario 2". If your choices include Site Preparation information from the Treatment selection screen, you should choose "Scenario 3". If your choices include Stand Tending information from the Treatment selection screen, you should choose "Scenario 4". Since our choices include selections from the Admin, and Site screens, as well as Site Preparation selections from the Treatment screen, we select "Scenario 3".



Your selections are processed, and a dialog box appears that informs you of how many individual trees (sample size) have been selected for the scenario submitted. If the sample size is acceptable, click "yes" to continue. If the sample size is unacceptable, click "no". You can then choose a different "Scenario " button from the

current form (for example, a less specific one). Or you can backtrack, via the close buttons, and redo your scenario selections on previous screens. You can imagine your selections as the database equivalent of a microscope. As you try and move to a tighter and tighter focus (more detailed scenarios) you may exceed the resolution of your database (few or no trees match your scenario selection criteria). Once you have created a scenario with an acceptable sample size, and chosen "yes" on the sample size dialog box, you proceed to the next screen, where the performance criteria that will determine your actuary tables can be chosen.



The screen "Free to Grow Criteria" deals with performance criteria for trees that have met our previous administrative, site, treatment and tree level scenario selection criteria. What we are now selecting is a base year: the year for which we want tree data for our analysis, and we have picked year 2. Then we set performance criteria by making selections in the "Greater Than or Equal To" and "Less Than or Equal To" columns. The columns refer to Free to Grow (or any performance standard) in terms of our measured values. In the context of the USSMUser database loaded in LifeLine --- ACT98, these variables are:

- Height, in centimetres
- Leader length in centimetres
- Internode length in centimetres

- Diameter (ground level diameter) in millimetres
- Vigour, a field assessment where 0=dead, 1=moribund, 2=poor, 3=fair, 4=good.
- Competition status ("Compstat") a field assessment where 1=overtopped, 2=threatened, 3=free to grow.

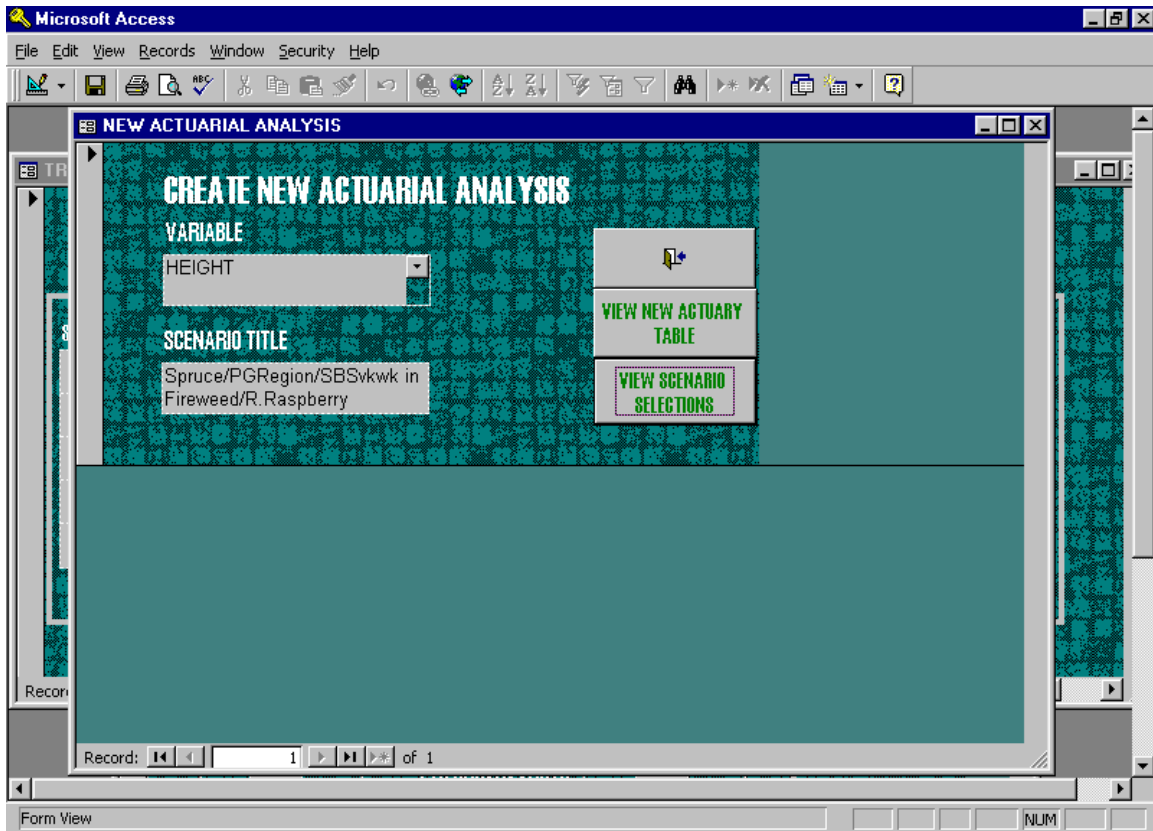
In this case, our selection criteria is that the trees must be 100 centimetres in height or greater .

When we hit the button with the graph icon, LifeLine --- ACT98's calculation engine is engaged, and actuary tables are created that determine the frequency (based on data in the database) that a tree with a particular value in the base year, reaches a performance target in a specific period of time. The actuary table thus estimates the likelihood of a particular input (data in a particular year) resulting in a specific output . In this NIVMA edition of LifeLine --- ACT98, the output variable is "free-to-grow classes", which are defined as follows:

1. Free to grow class 1: Trees that reach the selected performance standard in 5 years or less.
2. Free to grow class 2: Trees that reach the selected performance standard in 6 or 7 years.
3. Free to grow class 3: Trees that reach the selected performance standard in 8 to 10 years.
4. Free to grow class 4: Trees that reach the selected performance standard in 11 to 15 years.
5. Free to grow class 5: Trees that reach the selected performance standard in over 15 years.
6. Free to grow class 6: Trees that die.

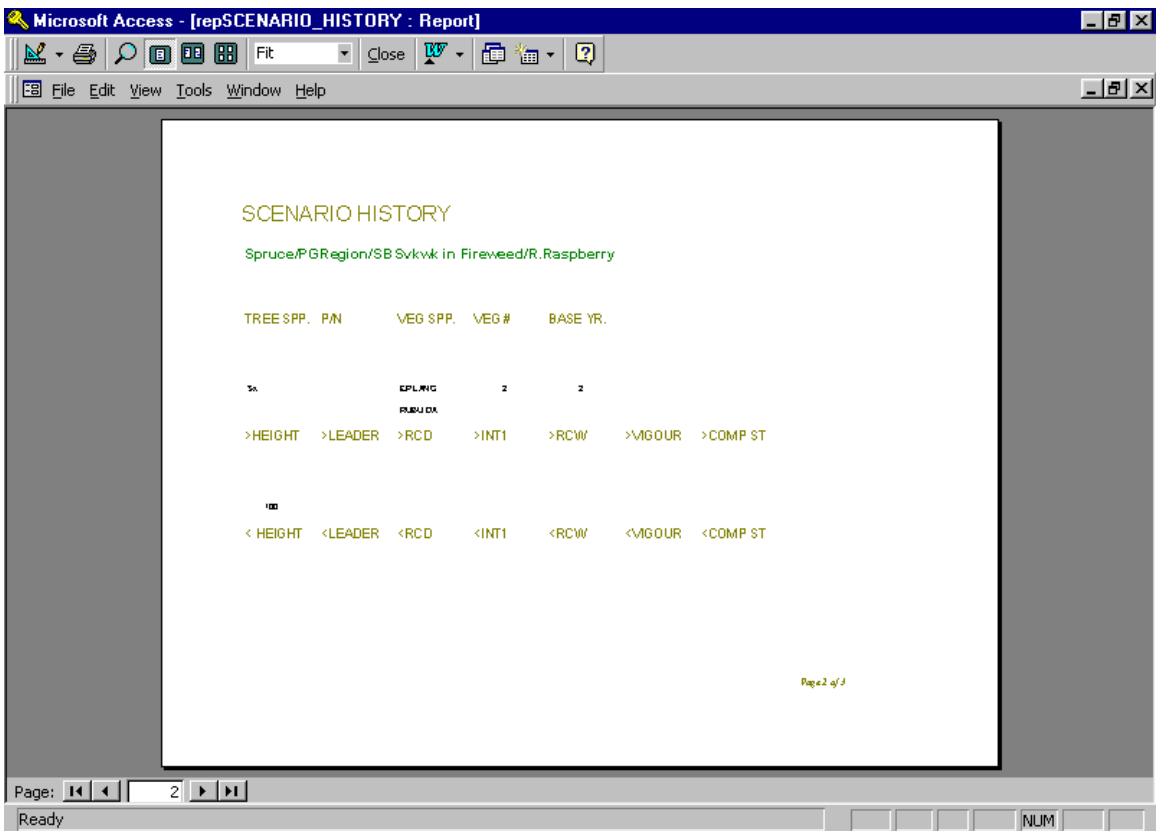
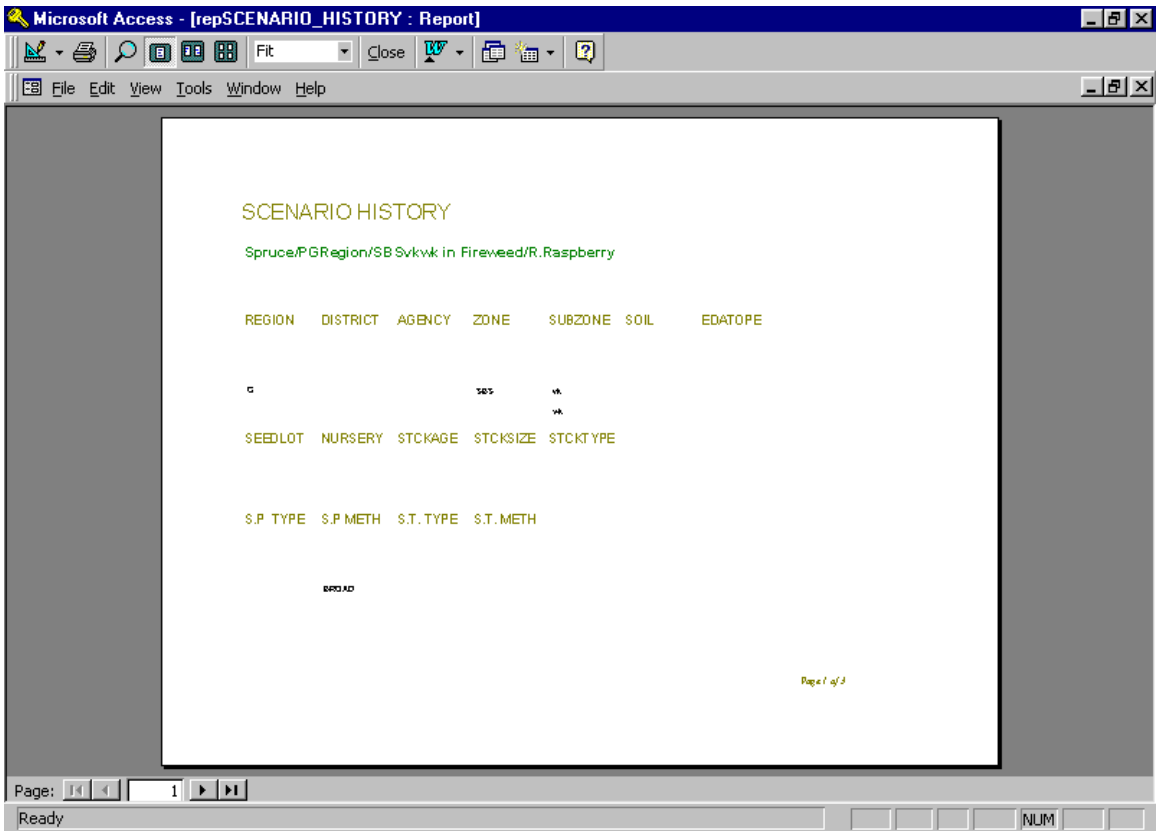
For a given Scenario, and a particular base year, with a specified set of performance standards, each tree is assigned to a free to grow class. Actuary tables are then calculated to identify for a particular input value (tree measurement in the base year), the cumulative frequency of trees reaching a particular free to grow class.

By the time you have read the above paragraphs of information LifeLine --- ACT98's calculation engine will have hopefully processed your scenario and performance standard selections, and you should be viewing the following screen.

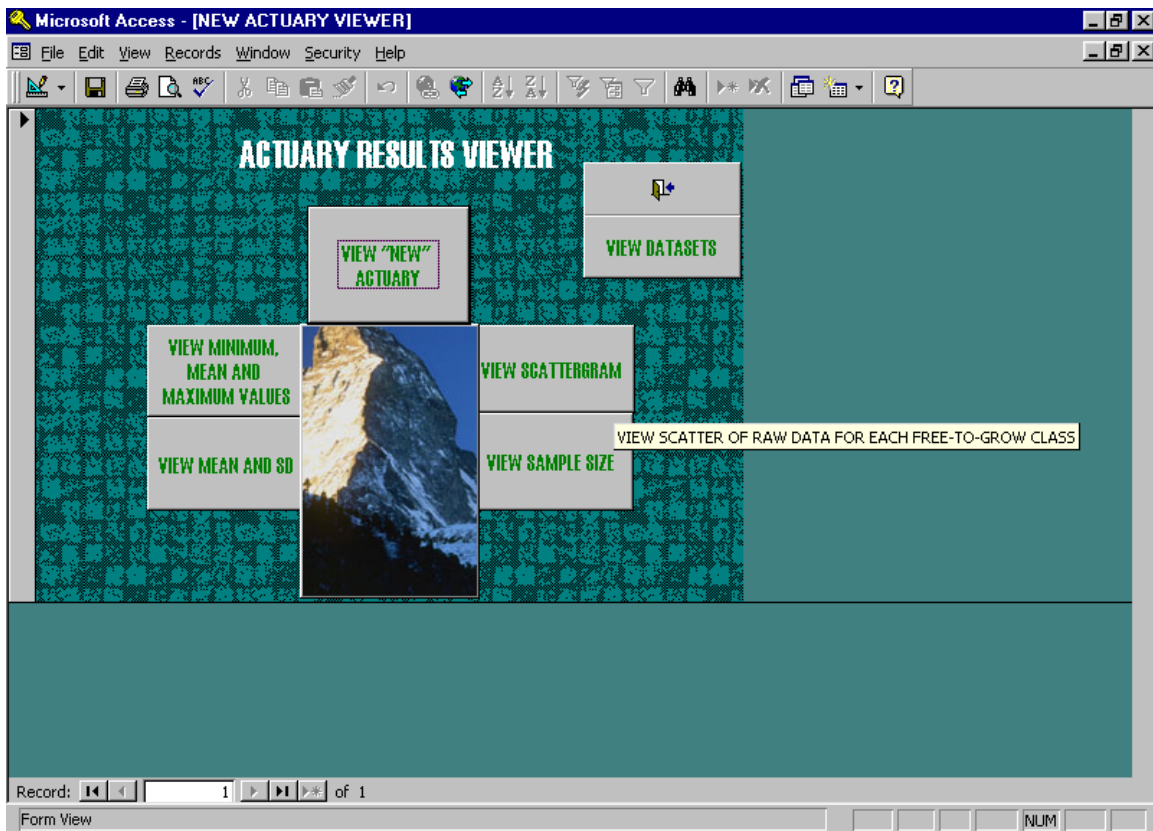


We select a variable from the list (height in this case), and give our scenario a descriptive name. The descriptive name should be no more than 48 characters in length in order to have the name appear on the Scenario reports described below. If there are no items in the list, it means one of two things. Firstly, it may mean that no trees in the scenario have achieved the performance standard we have set. Then we need to modify it by pressing the button with the close icon, and then go back a step, and set new performance criteria. Alternatively, a blank list might tell us all we needed to know: no trees in the scenario achieved the performance standard. Secondly, it may mean that the trees selected were not measured in the base year you have chosen. If you used year 2, try year 1 or year 3 since trees were measured on different schedules.

There are two buttons that we can press next. If we wish to view our results, we press, "View New Actuary Table". More often than not, the sticky pad scribblers among us will have forgotten the details of the scenario that had been selected so far. In that case, press the button "View Scenario Selections" to create the report below.



Having refreshed our memory as to our scenario and performance standards, we can proceed to view the results of our analysis, by pressing the button, "View New Actuary Table".

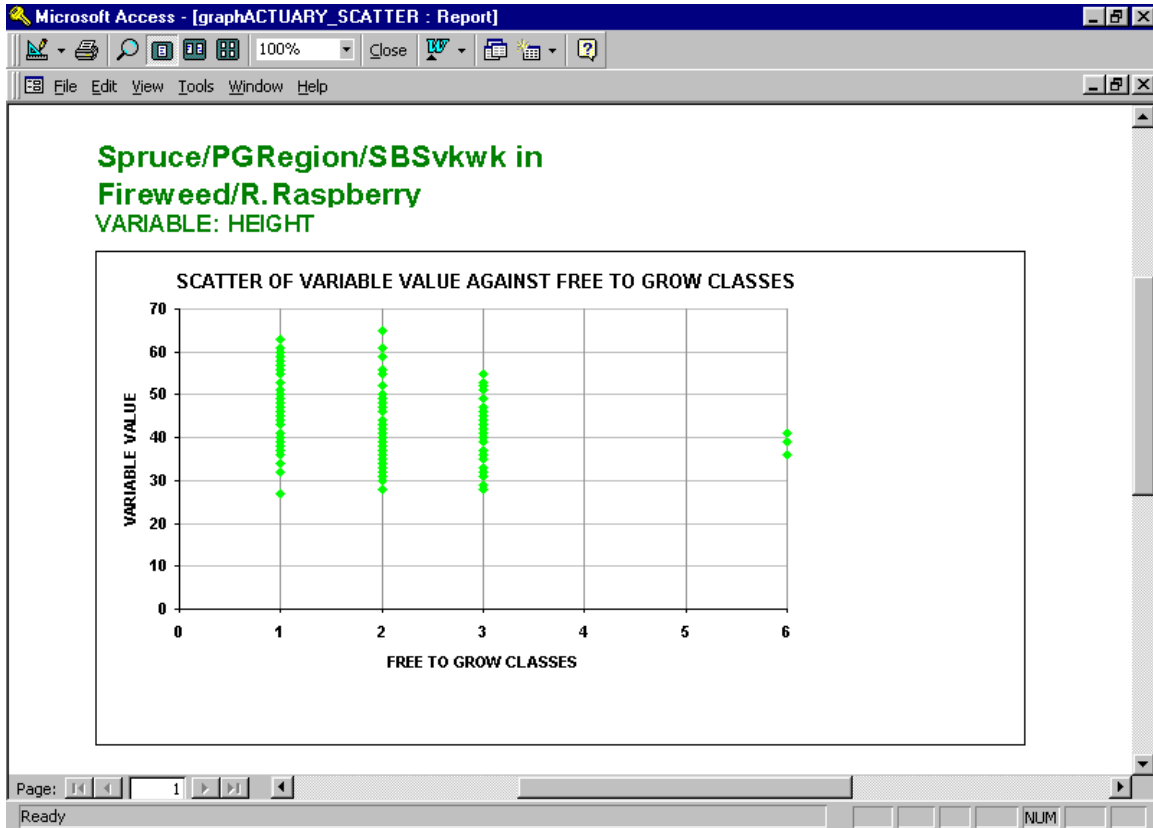


This screen presents a number of graphical analyses for the variable selected in the previous screen.

The buttons in the centre of the screen present 5 analytical views of the data set we have generated from our selections and performance standards.

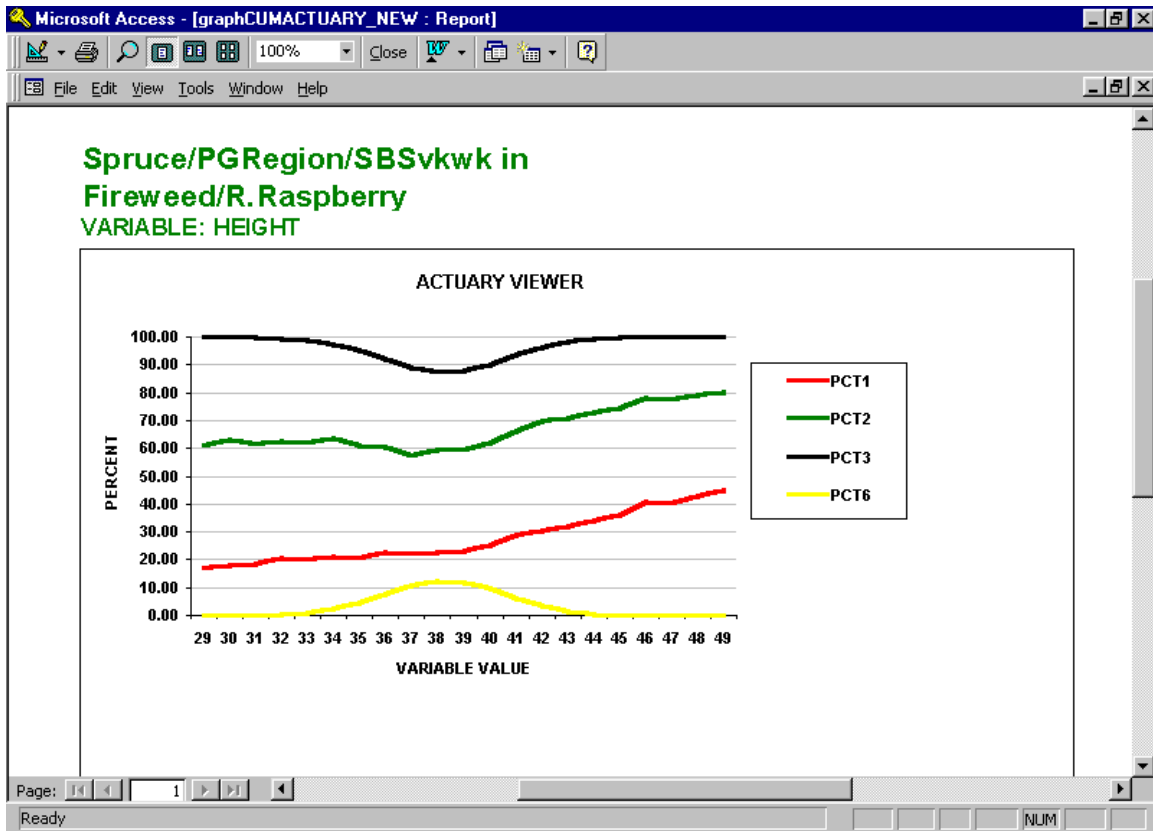
1. "View New Actuary" presents results as an actuary curve.
2. "View Scattergram" presents results in terms of scatters of variable values against free to grow class.
3. "View Sample Size" presents results in terms of the number of trees assigned to each free to grow class.
4. "View Means and Standard Deviations" presents results in terms of the mean and standard deviation for each free to grow class.
5. "View Minimum, Mean, and Maximum Values" presents results in terms of just those statistics.

Collectively these views give us several complementary representations of the structure of the data resulting from our scenario selections and performance standards. Different people will emphasize different aspects of the data. We'll examine only two views within this tutorial, the scattergram and the actuary curve, and leave investigation of other views to the user.



The scattergram view presents the individual variable values plotted for each free to grow class. This represents the data set extracted by our scenario, for a specific base year and variable (year 2 height in this example). For this scenario we note there are few dead trees (free to grow class 6) and their distribution is restricted to lower height values. Data points for free to grow classes 1 to 3 are distinguished by their pattern for higher values of height. This view is good for getting an idea of the distribution of data within each free to grow class, differences between free to grow classes, and to look for outliers. We note that most of the data lies between 30 and 60 cm.

I find the scattergram view very useful also in interpreting the actuary view, below.



This view requires a little more explanation than the scattergram view.

- The horizontal axis represents the selected variable (in this case height).
- The vertical axis represents the percent of trees that reach a free to grow class .
- Each line represents the cumulative percent of trees in a free to grow class. For example, the red line represents the percent of trees in free to grow class 1, 5 years or less ("PCT1" in the legend, to read as "percent in free to grow class 1")
- The green line represents the cumulative percent of trees in free to grow class 2, 7 years or less ("PCT2" in the legend, to read as "percent in free to grow class 2")
- The black line represents the cumulative percent of trees in free to grow class 3, 10 years or less ("PCT3" in the legend, to read as "percent in free to grow class 3").
- The yellow line (PCT6, percent of trees in free to grow class 6) represents the percent of trees for a particular variable value that died.
- Because the lines are cumulative percents (for the living trees) they stack on top of each other. That is all trees reaching free to grow in 5 years, by default must also reach free to grow in 7 years.

To give an example of how to interpret actuary tables, let's look at a particular value, say 45 centimetres (45 on the horizontal axis), and two free to grow classes, 1 and 2. That is, we are looking at the percent of trees that were 45 cm in year 2 for the scenario we have selected that reached our free to grow performance of 100 cm in height by a particular time period. We draw a vertical line up from the value, 45, and note where it intersects the coloured lines. We note,

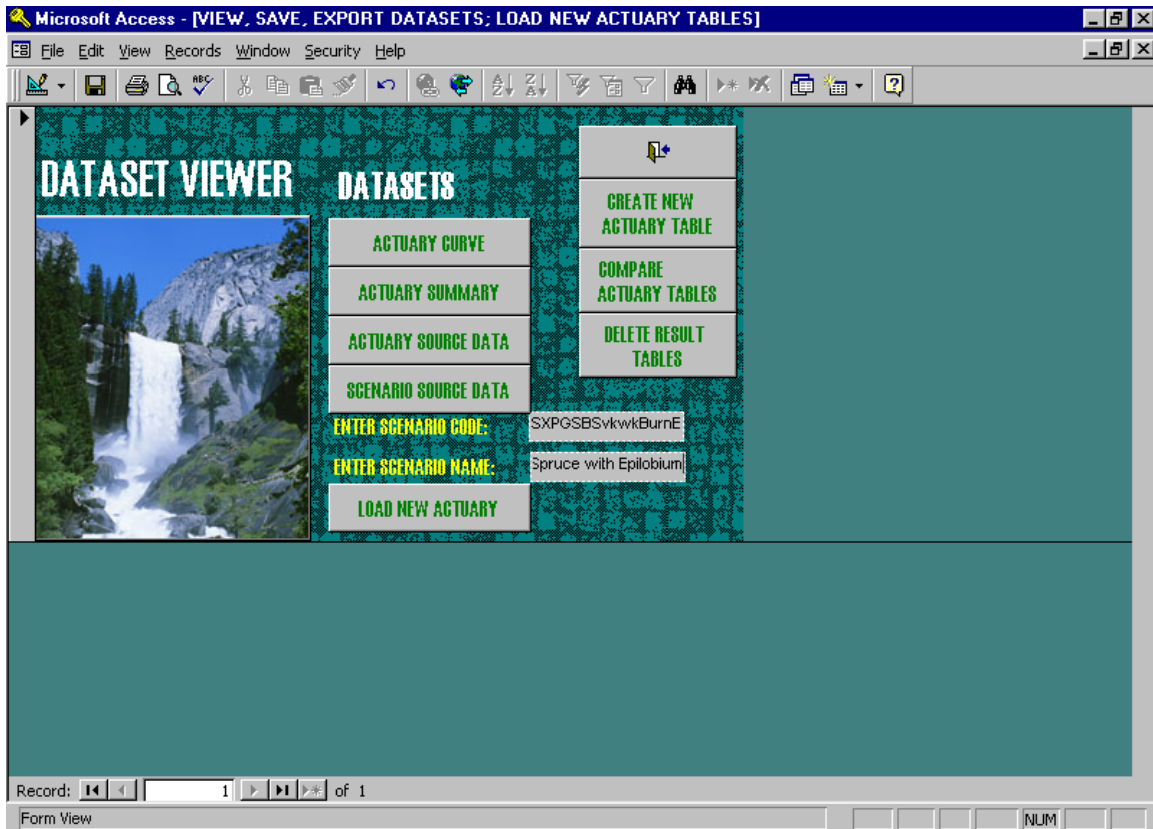
- It intersects the red line of free to grow class 1 at approximately 40 percent (on the vertical axis). That is, 40 percent of the trees in the scenario reached 100 cm in height in 5 years or less, if they had a height of 45 cm at year two.
- It intersects the green line of free to grow class 2 at approximately 75 percent (on the vertical axis). That is, 75 percent of the trees in the scenario reached 100 cm in height in 7 years or less, if they had a height of 45 cm at year two.
- It intersects the black line of free to grow class 3 at approximately 100 percent (on the vertical axis). That is, 100 percent of the trees in the scenario reached 100 cm in height in 10 years or less, if they had a height of 45 cm at year two.
- It intersects the yellow line of free to grow class 6 at approximately 0 percent (on the vertical axis). That is, 0 percent of the trees in the scenario died, if they had a height of 45 cm at year two.

We could make the same comparison for a different height value, say 35 cm on the horizontal axis, and determine how trees in the scenario of that size meet the performance standard we have set.

The actuary view is powerful because it allows you to determine a pattern of change in performance standards as variable values change in a particular base year for a particular scenario. However the view takes some getting used to, and you have to be careful to interpret only within the range for which you actually have data (30 to 60 cm) in this case, and pay attention to such issues as sample size, variability of the data, etc. Interpretation is best done, by examining several of the views available, and finding out what appears to be the "consistent story" across the different views.

To switch variables viewed, select the "close" button, and return to the previous screen. You can pick another variable such as leader length, or stem diameter, for your scenario and performance standards and view them.

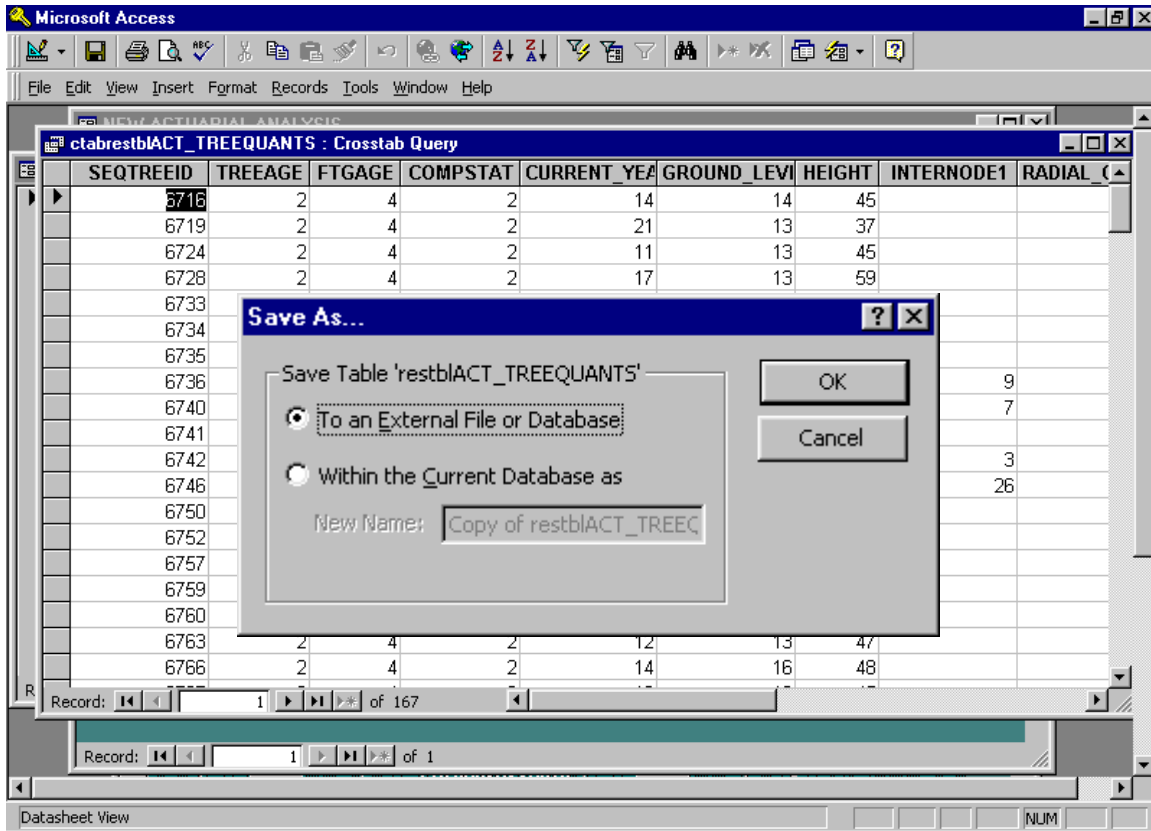
To view the actual datasets, or to export them, press the "View Datasets" button on the Actuary Viewer screen and proceed forward to the "Dataset Viewer" screen.



From the "Dataset Viewer" screen, a number of options are available:

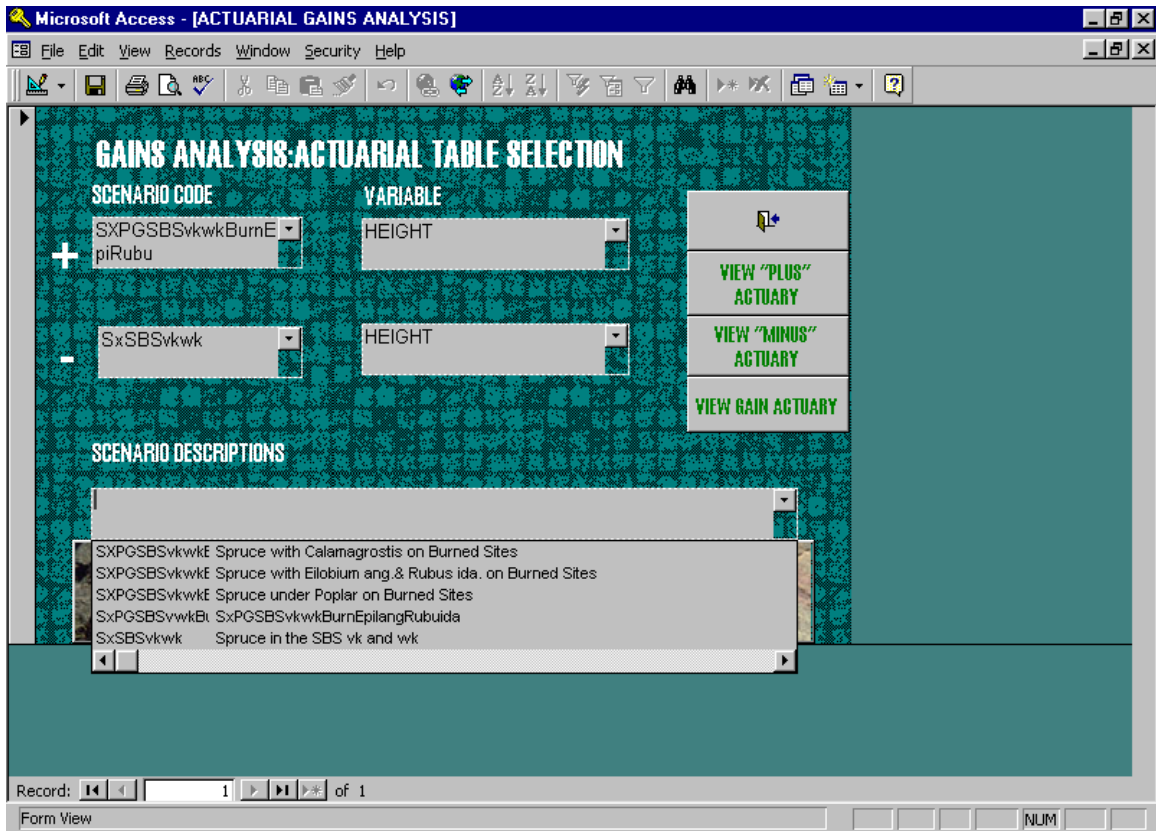
- You can load the actuary table you have just viewed for the selected variable, by giving it a unique code and entering a scenario name (text boxes beside the yellow labels) and then pressing the button "Load New Actuary". You can go back to the previous screens, and load an actuary for other variables for the same scenario. It's recommended you use the same code identifier for all variables for the same scenario.
- You can view the datasets you have generated. These datasets are exportable to other programs such as Cognos Scenario and Microsoft Excel for further analysis.
- You can create a new scenario, performance criteria, and resulting analyses by pressing the "Create new Scenario" button.
- You can compare previously saved actuary tables by pressing the "Compare Actuary Tables" button.

To view a dataset, select the button for that dataset, in this case we selected the “Actuary Source Data” button.



To export the dataset to another program, from the menu bar, choose File/SaveAs/Export and the “Save As” dialog box will appear. Check the option “To an External File or database”. You can save the data in various formats, depending on the file export options you have loaded into your version of Access97.

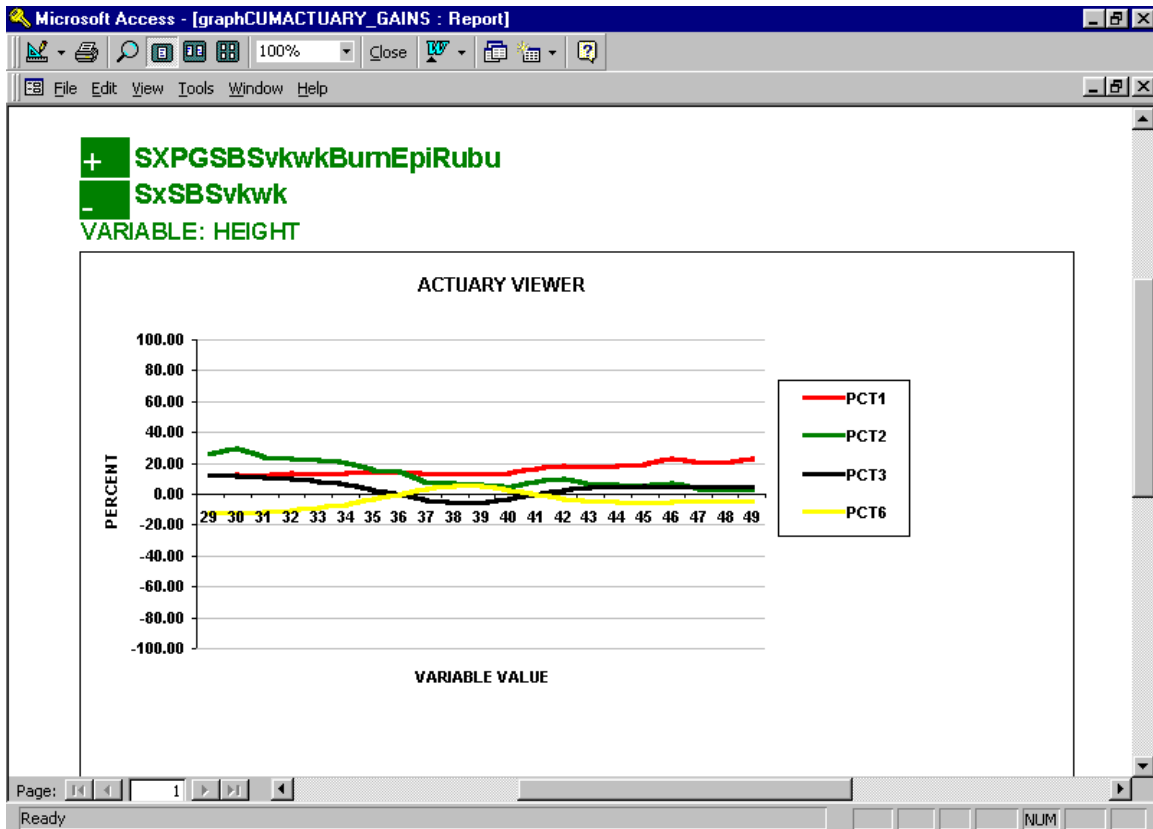
To compare actuary tables choose the button “Compare Actuary Tables” from the Dataset Viewer screen.



Scenario descriptions are listed in a listbox at the bottom of the “Gains Analysis Actuarial Table Selection” screen.

To compare the actuary tables for two scenarios you must:

- Make sure you have previously loaded the actuary table (It will appear in the “Scenario Descriptions” list.
- Make sure you have previously loaded the actuary tables for the same variables (you can’t compare an actuary curve for Height to one for Leader Length).
- Select a “+” scenario: an actuary table code and the variable you want to compare. To remind yourself what the results looked like, press the button, “View Plus Actuary”.
- Select a “-“ scenario: an actuary table code and the variable you want to compare. To remind yourself what the results looked like, press the button, “View Minus Actuary”.
- Press the button “View Gain Actuary” to compare the two scenarios. You will see something like the figure below.



What is represented in this graph are the differences between the actuary curves for your two scenarios. If the resulting lines are above the horizontal zero line, there is a gain between the “+” scenario and the “-” scenario (note, for the yellow line that would be a gain in percent mortality). Alternatively, if the resulting lines are below the horizontal 0 line, there is a decrease between the “+” scenario and the “-” scenario (note, for the yellow line that would be a decrease in percent mortality).

At this point, you can return to the “Gains Analysis Actuarial Table Selection” screen and compare other scenarios, or hit the close button to step back into the “Dataset Viewer” screen. From the “Dataset Viewer” screen, you can either begin a new scenario or step back through the one you have already created.

Finally, if you are ready to close out of the program, you can hit the button “Delete Result Tables”, which will remove extraneous datasets created during your run.

Note that you should occasionally compact your database so that it does not use up excessive disk space. See the Access97 user manual for details.

At this point: Congratulations, you have completed the tutorial.

ACKNOWLEDGEMENTS

The people who made this possible

The ideas that led to the creation of LifeLine --- ACT98 came out of a 5 year dialogue, and we would like to thank the following for the ideas and insights they have shared with us over the years. This program would have not been possible without their faith and efforts:

Andy Becker

Joe Forster

Ian Moss

Paul Sears

Tom Szauer